



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/912,495	07/24/2001	Steve Ghanayem	5049	6265
32588	7590	04/23/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			MEEKS, TIMOTHY HOWARD	
			ART UNIT	PAPER NUMBER

1762

DATE MAILED: 04/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/912,495	<b>Applicant(s)</b> GHANAYEM ET AL.	
	<b>Examiner</b> Timothy H. Meeks	<b>Art Unit</b> 1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5, 7-10, 12-14 and 16-21 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-10, 12-14 and 16-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Art Unit: 1762

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/8/04 has been entered.

### ***Application Status***

The amendment filed on 3/8/04 amended claims 1 and 12 and canceled claims 6 and 11. Claims 1-5, 7-10, 12-14 and 16-21 are pending as amended.

### ***Withdrawn Rejections***

All previous rejections are withdrawn. The obviousness type double patenting rejections are withdrawn because a terminal disclaimer was filed on 3/8/04. The remaining rejections are withdrawn in view of amendments made by applicants on 3/8/04.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1762

Claims 1-5, 7-10 and 16-20 are rejected under 35 U.S.C. 103(a) as being obvious over Xia et al. (6,177,344) in view of Liou (5,424,571) and Ozawa et al. (5,474,410).

The applied reference to Xia has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Art Unit: 1762

Xia et al disclose formation of a BPSG layer having the claimed boron and phosphorus concentrations, formation of a USG capping layer, and reflowing the layer (col. 6, lines 6-55 and col. 5, lines 1-17). In the embodiment where RTP is used for reflowing, an atmosphere of wet oxygen is introduced instead of hydrogen for formation of a wet atmosphere. However, because it is disclosed at col. 5 lines 1-17 that introducing hydrogen in a chamber containing oxygen is effective for forming a wet atmosphere for reflowing by reaction of the hydrogen and oxygen, it would have been obvious to have generated the wet atmosphere required for reflowing in this manner in the RTP process as doing so would be expected to be operable for providing the wet atmosphere.

The ramp rate range of 50 to 100 °C per minute is slightly higher than the claimed range of 20 to 40 °C per minute. However, use of ramp rates in the claimed range would have been obvious for the reasons established in the above rejection.

Xia does not show forming the BPSG layer in a first chamber of a sealed multi-chamber system and then reflowing the layer in a second chamber of the sealed multi-chamber system as added to the claims in the 3/8/04 amendment. However, because Liou discloses at col. 3, lines 5-34 that formation of BPSG and reflowing thereof can be integrated in a single processing step in a cluster tool, which is a sealed multi-chamber apparatus, and Ozawa et al. disclose at col. 1, lines 44-50 that such sealed multi-chamber apparatus are more advantageous as compared to a single chamber system because wafer transfer and cassette chambers can be made common to the vacuum process chambers, it would have been obvious to have formed the BPSG layer in a first chamber of a sealed multi-chamber system and then reflow the layer in a second chamber of the system because one would have had a reasonable expectation of said process being successful as evidenced by Liou and in so doing one would have expected to obtain the benefit of providing wafer transfer and cassette chambers made common to the vacuum chambers as evidenced by Ozawa.

Claims 12-14 and 21 are rejected under 35 U.S.C. 103(a) as being obvious over Xia et al (6,177,344) in view of Liou and Ozawa as applied above, and further in view of EP 843348 (EP '348).

Xia, etc. are applied as above. These references do not explicitly disclose depositing a USG layer on the BPSG layer. However, given the advantages disclosed at page 32, lines 8-20 of EP '348 for depositing a USG capping layer on a doped silicon oxide layer it would have been obvious to have deposited a USG capping layer on the BPSG layer to achieve these advantages.

Claims 1-5, 7-10, 12-14 and 16-21 are rejected under 35 U.S.C. 103(a) as being obvious over EP 843348 (EP '348) in view of Xia et al. (J. Electrochem. Soc.), Liou and Ozawa et al.

EP '348 discloses formation of a BPSG layer with the claimed concentrations of boron and phosphorus and under the claimed deposition conditions at page 30, line 50 to page 31, line 30. Formation of a USG capping layer is described at page 32, lines 8-19. The BPSG layer is reflowed by heating to a temperature of 750 to 950 °C from a deposition temperature of 550 to 650°C and a multi-step reflow wherein the temperature is ramped to an intermediate temperature and then to the reflow temperature is also disclosed (page 33, lines 35-52).

EP '348 is silent as to the ramp rate to use. However, use of ramp rates in the claimed range would have been obvious for the reasons set forth above.

EP '348 does not explicitly disclose reflowing in an RTP chamber in a steam atmosphere formed by reaction of hydrogen and oxygen. However, because Xia discloses in the abstract and experimental that both conventional furnaces and RTP chambers are effective for reflowing BPSG layers and at page 1886 that reflowing in a steam ambient provides better results than other reflowing atmospheres, it would have been obvious to perform the reflowing in a steam atmosphere in an RTP chamber because doing so would be expected to be operable for reflowing the BPSG layer and provide better results than reflowing in other atmospheres.

Art Unit: 1762

EP '348 does not show forming the BPSG layer in a first chamber of a sealed multi-chamber system and then reflowing the layer in a second chamber of the sealed multi-chamber system as added to the claims in the 3/8/04 amendment. However, because Liou discloses at col. 3, lines 5-34 that formation of BPSG and reflowing thereof can be integrated in a single processing step in a cluster tool, which is a sealed multi-chamber apparatus, and Ozawa et al. disclose at col. 1, lines 44-50 that such sealed multi-chamber apparatus are more advantageous as compared to a single chamber system because wafer transfer and cassette chambers can be made common to the vacuum process chambers, it would have been obvious to have formed the BPSG layer in a first chamber of a sealed multi-chamber system and then reflow the layer in a second chamber of the system because one would have had a reasonable expectation of said process being successful as evidenced by Liou and in so doing one would have expected to obtain the benefit of providing wafer transfer and cassette chambers made common to the vacuum chambers as evidenced by Ozawa.

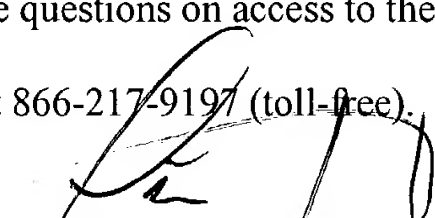
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy H. Meeks whose telephone number is 571-272-1423. The examiner can normally be reached on Mon., Tues., Thurs.(6-6:30), Fri.(6:30-10:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on 571-272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



Art Unit: 1762

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Timothy H. Meeks  
Primary Examiner  
Art Unit 1762